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Specification and Drawings, as originally filed, with Application for Patent Serial No:
2,424,337, on March 31, 2003, by **TESCO CORPORATION**, assignee of Robert Tessari
and Bruce Houtchens, for "Liner Drilling and Cement Tool".

**CERTIFIED COPY OF
PRIORITY DOCUMENT**

Tracy Paulhus
Agent/Certificateur/Certifying Officer

April 6, 2004

Date

Canada

(CIPO 68)
04-09-02

OPIC  CIPO

LINER DRILLING & CEMENTING TOOL

Overriding Design Objective

- The LDCT system must be capable of drilling in, hanging and cementing the liner without tripping of the inner running/drilling/cementing string.

Detailed Design Capabilities

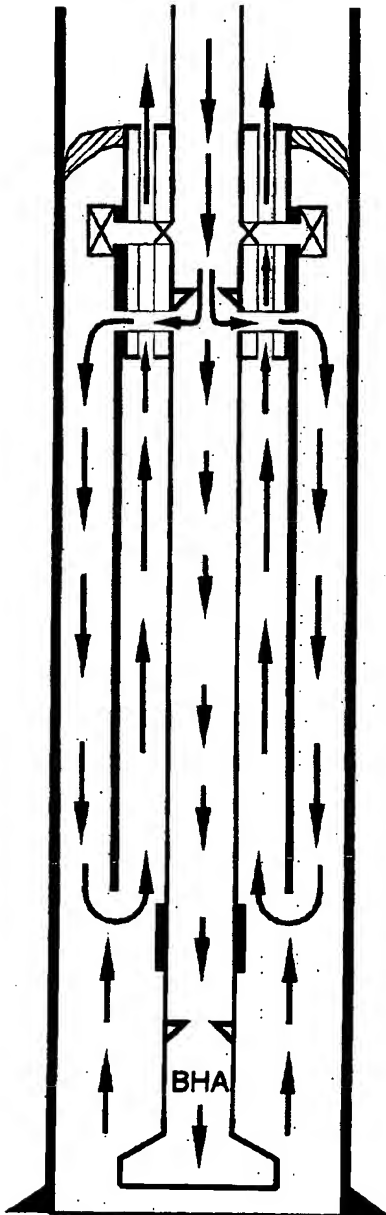
- Drill in liner while reducing ECD with partial reverse circulation with PDC Underreamer
- Hang Liner (Hydraulically set slips and pack-off)
- Release Liner (to ensure mechanical separation)
- Cement Liner (reverse cement into liner-borehole annulus)
- Close Cementing Ports (to avoid U-tubing of cement slurry)
- Reverse out cement slurry from the drill pipe



LINER DRILLING & CEMENTING TOOL

①

Run In Hole



- Make up and run liner
- Run BHA
- Install Pre-Assembled Liner hanger and LDCT
- Run liner and DP to Intermediate casing shoe (Displaced returns are routed thru LDCT)

BHA COULD CONSIST OF

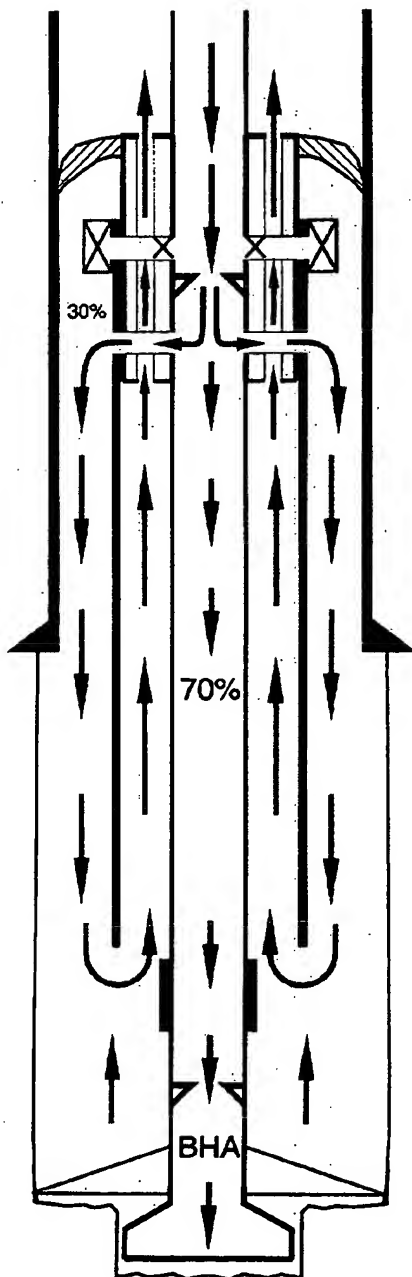
- 10 5/8" Pilot Bit
- 14" Cut Tesco PDC Underreamer
- Positive Displacement Motor
- MWD/LWD as req'd
- Lower Ball Catch Sub
- Pump Out Sub



LINER DRILLING & CEMENTING TOOL

②

Drill



- Drill out intermediate shoe
- Drill ahead to liner total depth
- Pump mud down drill pipe
- 30% down liner casing annulus
- 70% goes down DP to PDM
- 100% flow up DP-liner annulus

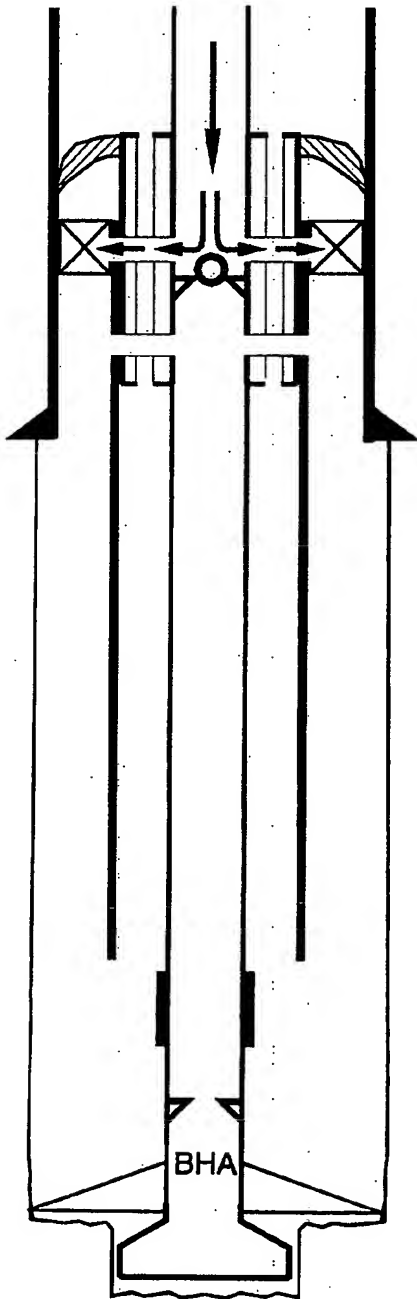


LINER DRILLING & CEMENTING TOOL

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Hydraulic Set Hanger
and Packoff

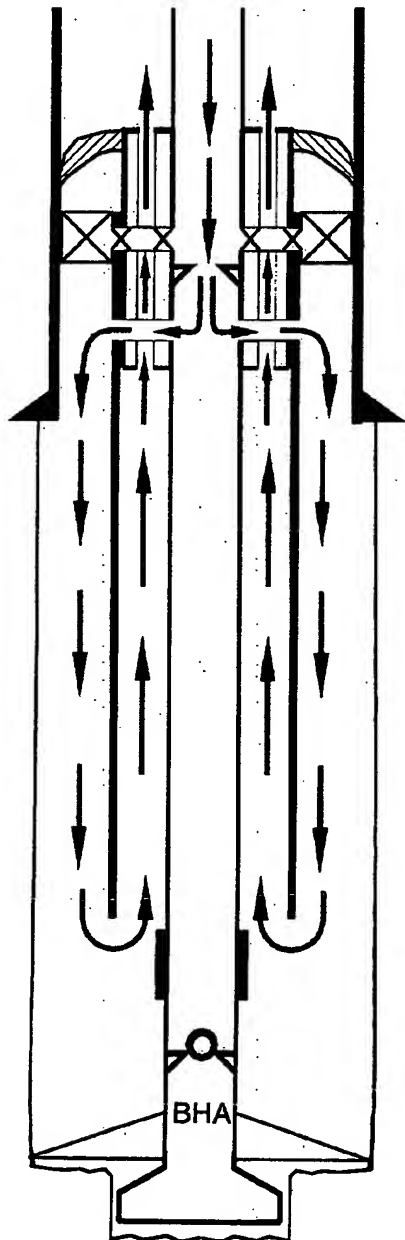
- At TD circulate hole clean
- Drop ball and hydraulic set hanger and packoff



LINER DRILLING & CEMENTING TOOL

④

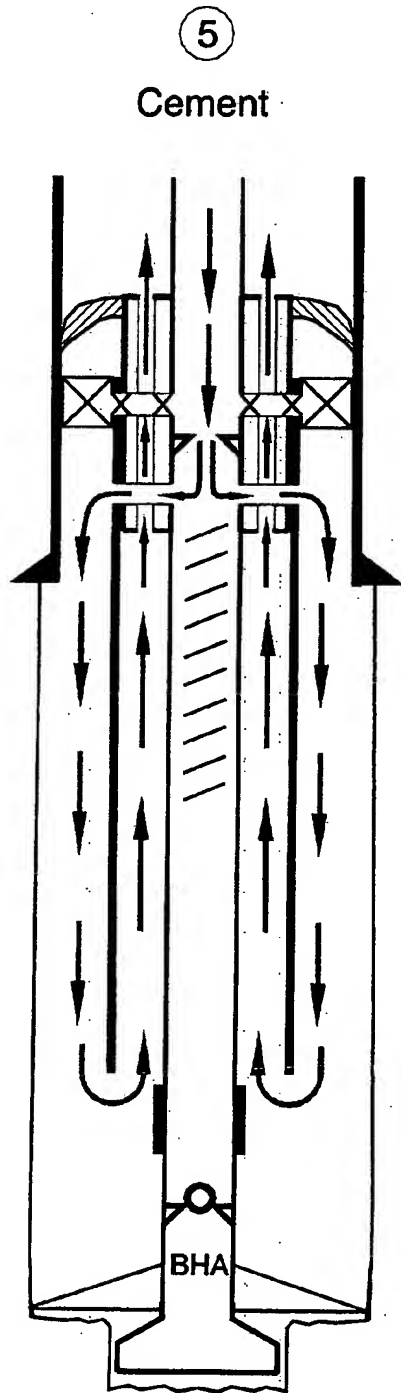
Release from Hanger



- Apply left hand torque to release LDCT from liner hanger.
- Hoist slightly to confirm liner release.
- Release ball and pump it to bottom sub.
- Establish circulation thru cementing ports
- Pump fluid caliper for cement volume determination



LINER DRILLING & CEMENTING TOOL



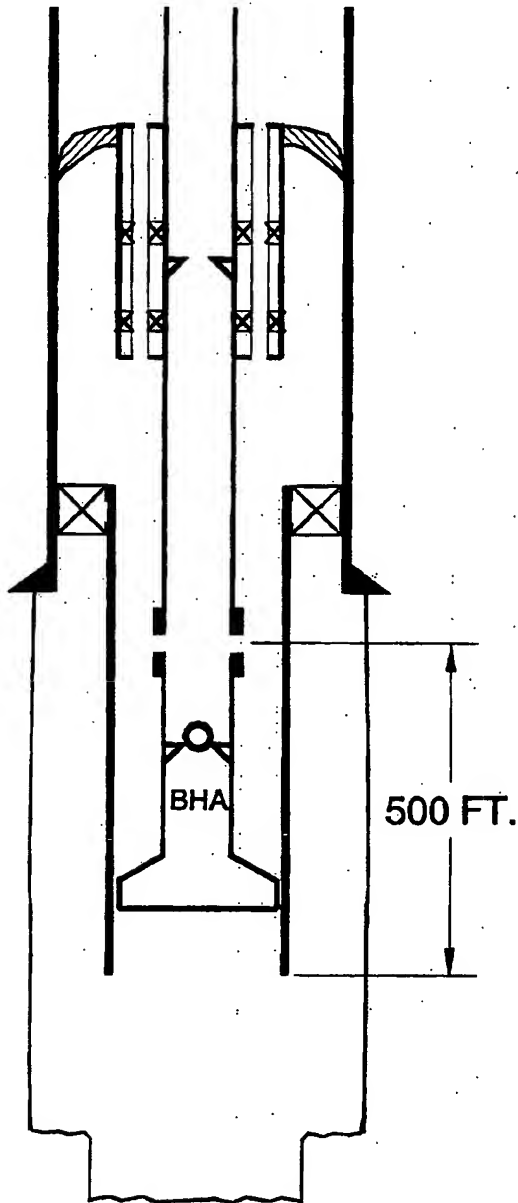
- Pump spacer and cement slurry as required down DP, out cement ports, and reversed down borehole-liner annulus.
- Displace cement to 200 ft. above LDCT (inside Drillpipe)



LINER DRILLING & CEMENTING TOOL

⑥

Pick Up 500 ft.
Close all ports
Open Pump Out Sub



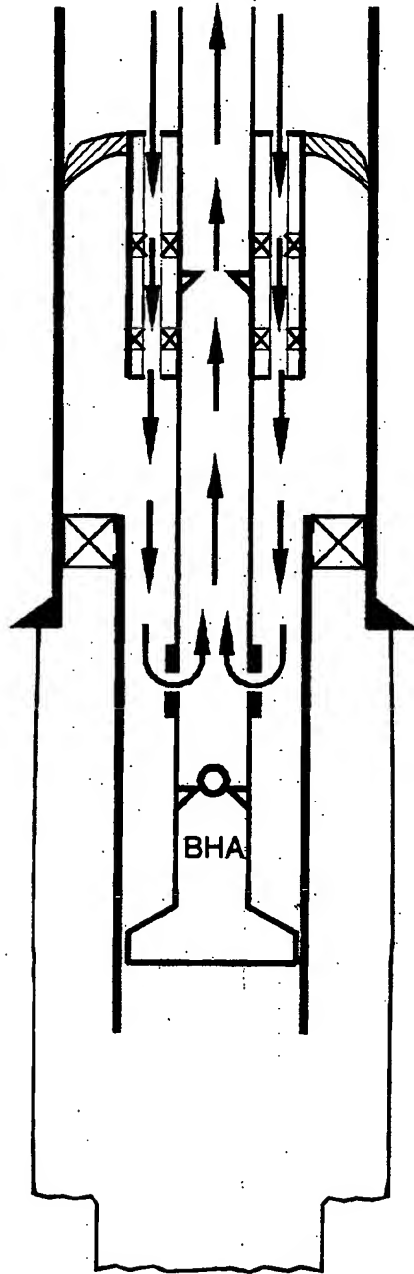
- Pickup to close cementing ports in both liner hanger and LDCT
- Hoist BHA (wet) to at least 500 ft above Liner shoe
- Pressure up to open Pump Out Sub (POS)



LINER DRILLING & CEMENTING TOOL

⑦

Reverse circulate to
Flush drillpipe



- Reverse circulate thru
Pump Out Sub down 13
3/8" casing annulus and
back up DP.

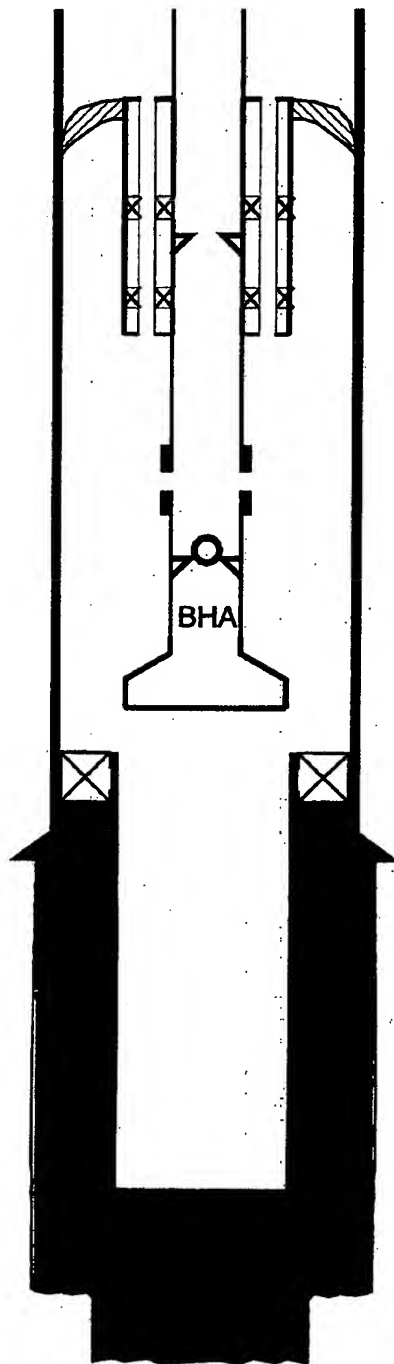


LINER DRILLING & CEMENTING TOOL

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Pul out of Hole

- Hoist drillpipe and BHA to surface



LINER DRILLING & CEMENTING TOOL

Summary

- This technology would enable the operator to drill in, hang and cement the 11 3/4" liner in place without the necessity to trip tubulars back thru open hole.
- There is huge potential to avoid open hole tripping problems and lost circulation problems by reducing ECD. Time will be saved by not having to trip for cementing.

